## ABSTRACT

# METHOD FOR REDUCING BIAS ERROR IN A VIBRATING STRUCTURE GYROSCOPE

5  A method for reducing bias error in a Vibrating Structure Gyroscope having a vibrating structure (1), primary drive means (2), for putting the vibrating structure (1) into carrier mode resonance, primary pick-off means (3) for sensing carrier mode motion, secondary pick-off means (10) for sensing response mode vibration of the vibrating structure (1) in response to applied

10  rotation rate, secondary drive means (16) for applying a force to control the response mode motion closed loop primary control loops for maintaining a fixed amplitude of motion at the primary pick-off means (3) for maintaining the drive frequency at the resonance maximum, and secondary control loops for maintaining a null at the secondary pick-off means (10). In the method the ratio

15  $SF_{QUAD}$ over $SF_{IN\text{-}PHASE}$ is measured from the secondary control loop to provide a direct measurement of $\mathrm{Sin}\,(\phi_{SD} + \phi_{PPO})$, according to the relationship $SF_{QUAD} = SF_{IN\text{-}PHASE} \times \mathrm{Sin}\,(\phi_{SD} + \phi_{PPO})$ where $SF_{QUAD}$ is the quadrature scalefactor $SF_{IN\text{-}PHASE}$ is the in-phase scalefactor, $\phi_{SD}$ is the phase error in the secondary drive means and $\phi_{PPO}$ is the phase error in the primary pick-off

20  means. The total phase error $\phi_E$ is obtained directly from the measured $\mathrm{Sin}\,(\phi_{SD} + \phi_{PPO})$ according to the relationship; $\phi_E = \phi_{SD} + \phi_{PPO}$ and phase corrections applied to the secondary drive means (16) and/or primary pick-off means (3) to reduce the phase error $\phi_E$ and hence the quadrature bias error to enhance the performance of the gyroscope.

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